reference 5

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 09-158478

(43)Date of publication of application : 17.06.1997

(51)Int.Cl. E04G 21/00

G06F 13/00

G06F 17/60

(21)Application number : 07-321888

(22)Date of filing : 11.12.1995

(71)Applicant : HITACHI LTD

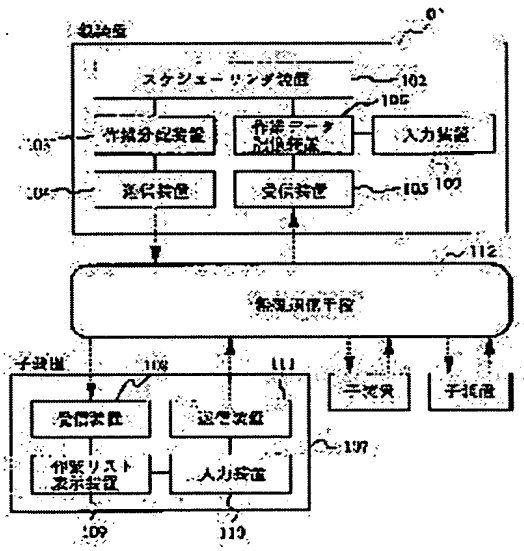
(72)Inventor : NONAKA HISANORI

ARAKI KENJI

KOBAYASHI YASUHIRO

OGOSHI SHIGERU

(54) CONSTRUCTION PROCESS CONTROL METHOD AND DEVICE



(57)Abstract:

PROBLEM TO BE SOLVED: To improve working efficiency by flexibly corresponding to change of a process by providing information concerning respective work to perform to a plural number of moving working groups at realtime.

SOLUTION: A construction process control device is constituted of a parent device 101 and a plural number of child devices 107 which are free to radiocommunicate with each other. The parent device 101 forms a construction schedule of a plant, extracts monitoring required work and sends a relative group working list to the child device owned by each

of the working groups. The child device 107 receives the group working list sent from the parent device, displays or prints and outputs the monitoring required work out of the working list in a form to discriminate it from other work. The information is input to the child device after completion of the work, and this information is transmitted to the parent device. The parent device receives this information, reschedules when required, forms a new group working list provided as a result and transmits it to each of the working groups.

LEGAL STATUS

[Date of request for examination] 24.10.2002

CLAIMS

[Claim(s)]

[Claim 1] Construction-schedule management equipment characterized by providing the following. It is construction-schedule management equipment which performs creation and management of a construction work schedule, and is parent equipment. It is the 1st function which is equipped with two or more slaves owned for every WG, and is transmitted to the slave which the aforementioned parent equipment extracts the important point surveillance work on production control while drawing up the schedule of the work which each WG should do, and it matches the schedule of the aforementioned work, and important point surveillance work, and each WG owns. The 2nd function to receive the information about completion of work from the aforementioned slave It has the 3rd function transmitted to the slave which updates the schedule of work, and important point surveillance work according to the information about completion of the received this work, and each WG owns. The 4th function to receive the schedule of the work to which a its original work business group should carry out each of two or more aforementioned slaves from parent equipment, The 5th function which outputs the schedule of the received this work to a user in form that important point surveillance work and the other work are distinguishable, and the 6th function to transmit this information to parent equipment when a user inputs completion of work into a slave

[Claim 2] It is construction-schedule management equipment which performs

creation and management of a construction work schedule. Parent equipment, It has two or more slaves owned every two or more WGs prepared beforehand. the aforementioned parent equipment Creation of a construction work schedule, and a scheduling means to make a change, A work distribution means to create the work list classified by group for every WG which has the schedule start time and finish time of the construction work contained in this schedule, and the identifier which shows whether the work concerned is the important point surveillance work on production control, The 1st transmitting means sent to the slave in which each WG owns each work list classified by group which this work distribution ****** created using a radio means, The 1st receiving means which receives the name and finish time of the completed work which is notified using a radio means from this slave, this, when the actual finish time of the work concerned which received by the 1st receiving means differs from the schedule finish time It is constituted by schedule change directions means to direct change of a construction work schedule for the scheduling means of the aforementioned parent equipment. the aforementioned slave The 2nd receiving means which receives the work list sent using a radio means from the 1st sending set of the above, this -- with an output means to output the work list received by the 2nd receiving means to a user in form that important point surveillance work and other work are distinguishable Construction-schedule management equipment characterized by being constituted by the 2nd transmitting means which notifies an input means by which a user inputs the name and finish time of the completed work, and the name and finish time of the this inputted work which was completed to the aforementioned parent equipment using a radio means.
[Claim 3] Construction-schedule management equipment which is characterized by providing the following and which performs creation and management of a construction work schedule Parent equipment It is the name of the work which should be equipped with two or more slaves owned every two or more WGs prepared beforehand, and should carry out the aforementioned parent equipment at least. Working hours this work is due to take The schedule start time and the finish time of a work data-storage means to match and memorize the conditions which should be satisfied in order to start this work, a scheduling means extract the important point surveillance work on production control while drawing up a construction work schedule based on this data, when these work data are created or changed, and the construction work contained in this schedule, and the identifier it is shown [whether the work concerned is the aforementioned important point surveillance work and]
[Claim 4] Construction-schedule management equipment which is characterized by

providing the following and which performs creation and management of a construction work schedule The name of the work which should be done at least Working hours this work is due to take A work data-storage means to match and memorize the conditions which should be satisfied in order to start this work The schedule start time and finish time of a scheduling means to extract the important point surveillance work on production control while drawing up a construction work schedule based on these work data, and the construction work contained in this schedule, and the identifier which shows whether the work concerned is the aforementioned important point surveillance work

[Claim 5] 1st transmitting means to notify to the slave in which each WG owns each work list classified by group which work distribution apparatus created in construction-schedule management equipment according to claim 4 using a radio means, The 1st receiving means which receives the name and finish time of the completed work which is notified using a radio means from the aforementioned slave, this -- the construction-schedule management equipment characterized by having with a correction means to correct the work data memorized by the aforementioned work data-storage means so that it may actually suit when the actual finish time of this work received by the 1st receiving means differs from the schedule finish time

[Claim 6] Construction-schedule management equipment according to claim 5 characterized by providing the following The aforementioned slave which each WG owns is 2nd receiving means which receives the work list classified by group notified using a radio means from the transmitting means of the above 1st. this -- an output means to output the work list classified by group received by the 2nd receiving means to a user in form that important point surveillance work and other work are distinguishable

[Claim 7] The aforementioned slave which each WG owns in construction-schedule management equipment according to claim 5 is construction-schedule management equipment characterized by to have the 2nd transmitting means which notifies an input means to by_which a user inputs the name and finish time of the completed work, and the name and the finish time of the this inputted work which was completed to the aforementioned parent equipment using a radio means.

[Claim 8] Construction-schedule management equipment characterized by the aforementioned important point surveillance work being the work of a critical path in construction-schedule management equipment given in either of the claims 4-7.

[Claim 9] Construction-schedule management equipment characterized by constituting the aforementioned WG based on an occupational description and a

work site in construction-schedule management equipment given in either of the claims 4-7.

[Claim 10] It is the construction-schedule management method which is characterized by providing the following and which performs creation and management of a construction work schedule using the parent equipment and two or more slaves which can radiocommunicate mutually, and is the aforementioned parent equipment. a1 Name of the work which should be done at least Working hours this work is due to take The step which extracts the important point surveillance work on production control while creating a construction work schedule based on the work data which matched the conditions which should be satisfied in order to start this work a2 The step which creates the work list classified by group for every WG which has the schedule start time and finish time of the construction work contained in the created this schedule, and the identifier which shows whether the work concerned is the aforementioned important point surveillance work, a3 Have the step which sends each created this work list classified by group to the slave which each WG owns by radio, and it sets to each slave. b1 The step which receives the work list classified by group from the aforementioned parent equipment, b2 The step which outputs the received this work list classified by group to a user in form that important point surveillance work and other work are distinguishable, b3 The step which inputs the name and finish time of the completed work, and b4 Have the step which notifies the name and finish time of the inputted work which was completed to the aforementioned parent equipment by radio, and it sets to the aforementioned parent equipment further. a4 The step which receives the name and finish time of the completed work from the aforementioned slave, a5 The step which judges whether the actual finish time of the received this work differs from the schedule finish time, a6 The step which corrects so that the work data memorized by the work data-storage means may suit an actual work progress situation, when judged with differing, and a7 Step which returns to Step a1 following Step a6

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]
[The technical field to which invention belongs] this invention relates to the equipment for managing planning of the construction-schedule plan of industrial plants, such as a power generating plant and a chemical processing plant, and progress of a process.
[0002]
[Description of the Prior Art] Conventionally, it is drawn up by the construction-plan section, and the construction schedule of an industrial plant is indicated by the operation sheet of an on-site office after being divided per WG. Every morning, a foreman (WG length) checks the work which should be done in the meeting before work on that day, and works by commanding the operator of a site. After the work of a day, the meeting reported the work situation of the day again, and when there was a problem, production control was performed in the form where it adjusts with a construction-plan section.
[0003] as conventional technology in connection with production control, the work-item management support equipment of a publication is in a construction process status-control system given in JP,5-282330,A, and JP,6-176029,A
[0004]
[Problem(s) to be Solved by the Invention] According to the conventional process planning and management technique, when it was carried out only twice [of - evening] fundamentally in the morning but there were change and delay of work, the information interchange between WGs could not cope with this flexibly, but the unnecessary latency time, the sequence error of work, etc. may have generated it.
[0005] Although the construction process status-control system given in aforementioned JP,5-282330,A has proposed the method which shares ****** in the progress situation of a process among two or more computers arranged for every workgroup, since it connects on-line, each computer is a non-portable system fundamentally, and is unsuitable as a managerial system of the construction schedule which a WG moves.
[0006] Moreover, although work-item management support equipment given in JP,6-176029,A performs updating management of the work data memorized by the memory in the main unit based on the work report data sent from two or more subequipments, it is Mukai-like [communication] on the other hand, and subequipment cannot obtain useful information about implementation of work.
[0007] Two or more WGs which work while it is made in view of such a conventional trouble and moving offer useful information on real time about the work which should

carry out each group, and this invention tends to correspond to change of a process flexibly, and tends to offer the construction-schedule management method and equipment which can raise the efficiency of work.

[0008]

[Means for Solving the Problem] In order to solve the aforementioned trouble, the construction-schedule management equipment by this invention It is construction-schedule management equipment which performs creation and management of a construction work schedule, and has parent equipment and two or more slaves owned for every WG. the aforementioned parent equipment The 1st function transmitted to the slave which extracts the important point surveillance work on production control while drawing up the schedule of the work which each WG should do, and matches the schedule of the aforementioned work, and important point surveillance work, and each WG owns, It has the 3rd function transmitted to the 2nd function to receive the information about completion of work from the aforementioned slave, and the slave which updates the schedule of work, and important point surveillance work according to the information about the completion of work which this received, and each WG owns. each of two or more aforementioned slaves The 4th function to receive the schedule of the work which a its original work business group should do from parent equipment, It is characterized by having the 5th function which outputs the schedule of the received this work to a user in form that important point surveillance work and the other work are distinguishable, and the 6th function to transmit this information to parent equipment when a user inputs completion of work into a slave.

[0009] In addition, in this specification, a "user" means persons using this invention, such as a foreman and an operator.

[0010] With the scheduling means of parent equipment, while creating the construction schedule of an entire plant, important point surveillance work is extracted. As the scheduling technique used with this means, the general technique, such as the PERT method and the CPM method (Tomoaki Sekine, PERT-CPM, Union of Japanes Scientists and Engineers, 1983 references), is used. For example, according to the PERT method, the work (work with which the delay of work leads to the increase in the whole time necessary for completion) of a critical path can recognize easily. The input data to the scheduling means memorized by the work data-storage means contains at least the name of work, and the standard operation time which the work takes and the order relation of work. In addition, the data (the work name, the incomplete work name which were completed) about work

classification and the present progress situation may be included. Moreover, a scheduling means will update a schedule using the changed data, if the work data memorized by the work data-storage means are changed.

[0011] In plant construction, a WG is constituted according to work occupational descriptions, such as conveyance, placing, piping, and welding, and a work site. With a work distribution means, the work of the construction schedule created and updated is assigned to a WG according to the content of work by the scheduling means.

[0012] The 1st transmitting means is sent to the slave in which each WG owns the work assigned to each WG in the form of a work list using a radio means.

[0013] The 1st receiving means receives the completion data of work sent from the slave which each WG owns using a radio means. When the received work is not completed as planned [original] at this time, a correction means changes the work data memorized by the work data-storage means according to the actual condition.

[0014] With the 2nd receiving means of a slave, the work list sent to the WG which owns this slave from parent equipment by the radio means is received, and it sends to work listing equipment.

[0015] Work listing equipment outputs a work list. At this time, important point surveillance work is outputted in a form distinguishable from other work.

[0016] Referring to the work list outputted to the slave, a foreman performs concrete workmanship instruction for an operator, and works preferentially from important point surveillance work especially.

[0017] When the work which was being done is completed, a foreman and an operator input completion of work from the input unit of a slave. An input unit sends the data about completion of work to the 2nd sending set.

[0018] The 2nd sending set sends the data about the completed work to parent equipment using a radio means.

[0019] In addition, in this invention, either [at least] a display or printing shall be included with the "output" to a user.

[0020] Since two or more WGs which work while moving by using the construction-schedule management equipment of a more than can obtain useful information on real time about the work which each group should do, it can respond also to change of a process flexibly and the efficiency of work improves.

[0021]

[Embodiments of the Invention] The form of 1 operation of the construction-schedule management equipment by this invention is shown in drawing 1 . The construction-schedule management equipment by the form of this operation

consists of three sets of one set of parent equipment, and slaves.

[0022] Parent equipment 101 consists of an input unit 100, scheduling equipment 102, the work distribution apparatus 103, a sending set 104, a receiving set 105, and work data storage 106. A workstation or a personal computer equipped with the radio function can constitute parent equipment 101.

[0023] Moreover, a slave 107 consists of a receiving set 108, work list display equipment 109, an input unit 110, and a sending set 111, and is owned for every WG mentioned later. A slave 107 is a portable personal computer preferably, and has a radio function. Furthermore, although not illustrated, you may build the printer equipment which carries out the printout of the work list in a slave 107.

[0024] Parent equipment 101 and a slave 107 deliver and receive data by the radio means 112.

[0025] If the sending set 104 of parent equipment 101, a receiving set 105 and the sending set 111 of a slave 107, and a receiving set 108 are constituted combining a modem and PHS telephone, they can use a public line. The radio means 112 in this case is equivalent to a PHS base station and the telephone exchange. Moreover, when between parent equipment and slaves is comparatively close, a public line cannot be used but the radio equipment of exclusive use can also be used. In this case, especially the radio means 112 does not have substance.

[0026] Below, the form of desirable operation of this invention is explained using drawing 1 , drawing 2 which showed the flow view of the processing performed with parent equipment 101, and drawing 3 which showed the flow view of the processing performed by the slave 107.

[0027] At Step 201 of drawing 2 , the work data for drawing up a construction-schedule plan are inputted into the work data storage 106 of parent equipment 101. Especially as an input unit 100 for inputting data, although not illustrated, a keyboard, an input with a scanner and voice, etc. are used.

[0028] An example of work data is shown in drawing 4 . In the example of the work data 40 shown in drawing 4 , the work number 41, and the work kind 42, a standard operation time 43 and the precedence work number 44 are matched about each work. "Precedence work" is the work or the work group which must be completed in order to start a certain work. For example, as for the work of the work number 2, work kinds are ["welding" and the standard operation time of precedence work] "work 1" for "1.5 hours."

[0029] Returning to drawing 2 , in Step 202, the scheduling equipment 102 of parent equipment 101 reads the work data memorized by the work data storage 106, and

draws up process planning. Specifically, the schedule which satisfies constraints, such as the whole time necessary for completion and order relation of work, and which can be performed is created by the scheduling technique represented by PERT and CPM. With the form of this operation, the schedule of the shortest time necessary for completion which satisfies the order relation of work shall be created by the PERT method.

[0030] The shortest time-necessary-for-completion schedule in the form of this operation created by the PERT method is shown in drawing 5 . The work on which the round mark was put by drawing 5 is the work of a critical path. Critical paths are a series of work groups without a float, and the delay of this work leads to extension of ** and the whole time necessary for completion. Conversely, that completion of the work on a critical path is rash leads to shortening of ** and the whole time necessary for completion. That is, the work of a critical path is the important point surveillance work which a foreman should be careful of.

[0031] The schedule of drawing 5 is sent to the work distribution apparatus 103 in fact in the form of the work list 60 as shown in drawing 6 . As for the work list 60, the work number 61, the work kind 62, a start time 63, a finish time 64, and the C.P. work 65 are matched about each work. C.P. Work 65 is an identifier the work indicates it to be whether it is the work of a critical path, and, as for this identifier, O mark on [of illustration] expedient is attached by drawing 6 . In fact, you may be another character, a sign, a sign, etc. In the work list of drawing 4 , work kinds are "carrying in and installation", and, as for the work of the work number 4, "9:30" and a schedule finish time are specified for a schedule start time like "11:30." It turns out that the work of this work number 4 is the work of a critical path since O mark is given to the C.P. work 65.

[0032] Returning to drawing 2 , in the following step 203, the work distribution apparatus 103 takes into consideration the kind of work, a work site, the WG that can be used, and distributes the work list of drawing 6 to each WG. With the form of this operation, carrying in and the installation group, the welding group, and the support installation group were considered as a WG, and the work according to the WG was distributed.

[0033] In addition, the table 120 which matched each WG and the recognition number of a slave in order to recognize, as show which WG has which slave to drawing 12 is beforehand memorized to the storage (for example, 106) of parent equipment 101. Parent equipment 101 can recognize the slave of each WG by referring to this table 120. On the contrary, each slave 107 also needs to know the recognition number (for

example, BN0001) of parent equipment. This is included in the information distributed to a slave from parent equipment, or the slave memorizes it in own storage. In addition, although not illustrated, the ID for communication is further memorized about each recognition number. You may use ID for communication itself as a recognition number.

[0034] The work lists 71, 72, and 73 classified by group distributed to drawing 7 at each WG are shown. The work lists 71, 72, and 73 classified by group of drawing 7 correspond to carrying in and the installation group, the welding group, and the support installation group, and consist of "work number" 701, "start-time" 702, "finish-time" 703, "P. work [C.]" 704, and five columns called "completion" 705 for every work, respectively. Each column corresponds to whether the recognition number each work was numbered, the start (schedule) time of this work, completion (schedule) time, and this work are the work of a critical path, and whether this work was completed. In drawing 7 , the work (five, work 1, work 4, work 7, work 8, and work 9) of a critical path is distinguished by putting a round mark on "P. work [C.]" 704 column like the case of drawing 6 . Moreover, the work which the round mark attached to "completion" 705 column by drawing 7 does not have one, and it turns out that one has not completed the work in each work list classified by group.

[0035] Returning to drawing 2 , subsequently in Step 204, a sending set 104 transmits the work list classified by group of drawing 7 to each WG through the radio means 112. That is, in the form of this operation, the work list of drawing 7 (b) is sent to a welding group, and the work list of drawing 7 (c) is sent for the work list of drawing 7 (a) to a support installation group at carrying in and an installation group.

[0036] Then, a receiving set 105 goes into a standby state in Step 205 until the information about the work completed from the slave 107 is sent.

[0037] On the other hand, in Step 301 of drawing 3 , the receiving set 108 of a slave 107 which each WG owns sends this to work list display equipment 109, when the work list classified by group sent to the its original work business group from parent equipment 101 is received.

[0038] In continuing Step 302, work list display equipment 109 displays the work list classified by group shown in drawing 7 to a foreman and an operator on screens, such as liquid crystal and CRT. By this invention, the critical path work which is an example of important point surveillance work is displayed on a screen in a display mode distinguishable from other work. Here, it is also distinguishable by the difference between the color which display a round mark on the "P. work [C.]" column of a work list, and important point surveillance work is shown, and also is

displayed, a typeface, and a graphic size etc.

[0039] A foreman does the work which commanded the operator and was assigned to the WG concerned, referring to the work list classified by group displayed on work list display equipment 109. Especially about the work of the critical path which has a round mark in the "P. work [C.]" column, although it is late, since [that the finish time of this work is early] it influences directly in the whole time necessary for completion, it is understood that it needs to be careful as work of important point surveillance.

[0040] When one work is completed, in Step 303, a foreman and an operator input the work and the finish time which were completed from the input unit 110 of a slave. This input is made in the form where the work which carried out the pen input of the round mark, or was completed by keyboard entry for example, in the "completion" column of the work list of drawing 7 displayed on screens, such as liquid crystal and CRT, is deleted from a work list.

[0041] If the information about the completed work is inputted from an input unit 110, in Step 304, a sending set 111 will transmit the name of the completed work, and the finish time of a schedule and an actual finish time to parent equipment 101 through the radio means 112 at the beginning.

[0042] Moreover, in Step 305, if all the work that should carry out a its original work business group is completed, processing of a slave will be ended. If it has not completed, it returns to Step 303.

[0043] Steps 301–302 and Steps 303–305 are the sequence which became independent in fact, and processing can be gone on regardless of the situation of another side. That is, even when an input unit 110 is in a standby state, a receiving set 108 can receive the updated work list classified by group which is sent from parent equipment, and can display this on display 109.

[0044] It returns to drawing 2 , and in the step 205, when the information about the work which the receiving set 105 of parent equipment 101 completed from the slave 107 is received, it inspects whether the completed work A was completed to as planned at Step 206 at the beginning.

[0045] If it inspects whether all work was completed and is Yes about it at Step 207 when Work A is completed to as planned, processing of drawing 2 will be ended, and if it is No, it will return to Step 205.

[0046] Whether Work A is completed at the beginning earlier than a schedule and when it completes late, in Step 208, the actual working hours of Work A are calculated, and the working hours of the work A memorized by the work data storage

106 are updated so that it may actually agree. When Work A is completed to as planned at the beginning, it progresses to Step 209.

[0047] At Step 209, it inspects whether all work was completed, if it is Yes, processing of drawing 2 will be ended, if it is No, it will return to Step 202, scheduling will be performed again, and a work list will be updated. The updated work list is again sent to the slave 107 which each WG owns through the work distribution apparatus 103, a sending set 104, and the radio means 112.

[0048] For example, carrying in and an installation group do work 1, and presupposes that this was completed to 9:30 as planned. Completion of work 1 is inputted from the input unit 110 of a slave 107 which carrying in and an installation group own, and is sent to parent equipment 101 through a sending set 111 and the radio means 112. The data sent to parent equipment 101 are the work number of the work completed with the form of this operation, the start time of the original schedule and a finish time, and an actual finish time. Although the receiving set 105 of parent equipment receives completion of work 1, since it is prearranged completion, renewal of the work data memorized by the work data storage 106 is not performed. Next, carrying in and an installation group do work 4, and presupposes that this was early completed from the schedule to 10:30 for 1 hour. Completion of work 4 is inputted from the input unit 110 of a slave 107 which carrying in and an installation group own, and is sent to parent equipment 101 through a sending set 111 and the radio means 112. The receiving set 105 of parent equipment 101 receives completion of work 1. To the finish time of the original schedule of work 4 being 11:30, since an actual finish time is 10:30, a receiving set 105 computes that the actual working hours of work 4 are 1 hour, and updates the work data memorized by the work data storage 106 here. That is, in the work data of drawing 4 , the standard operation time of work 4 is changed into 1.0 from 2.0.

[0049] The scheduling equipment 102 of parent equipment redoes scheduling in response to this change using the updated work data, and updates a schedule as shown in drawing 5 . The schedule obtained as a result is shown in drawing 8 . While the whole time necessary for completion is shortened for 30 minutes at the beginning as compared with the schedule of drawing 5 of a schedule, it turns out that the work of a critical path was changed into five, work 1, work 2, work 3, work 6, and work 9. The work list corresponding to the work schedule of drawing 8 is shown in drawing 9 . The work list 90 of drawing 9 is divided into the work list 121,122,123 classified by group packed for each [are further shown in drawing 10 by the work distribution apparatus 103 of parent equipment] WG of every, and is sent to the WG

corresponding to each work list through the radio means 112 by the sending set 104.
[0050] The foreman and operator of each WG can recognize the work of important point surveillance with reference to the work list 121,122,123 classified by group of drawing 10 . For example, work's 7 having stopped being the work of a critical path and the welding group having changed the work of a critical path to work 2 from work 8 and a support installation group can know that all the work which a self-group takes charge of on that day turned into work of a critical path. [of carrying in and an installation group] The information about these important point surveillance work is useful information in case it works on the spot, when these information is acquired by real time along with progress of a schedule, it can respond also to change of a process flexibly and its efficiency of work improves.
[0051] The form of another operation by this invention is shown in drawing 11 . In drawing 11 , scheduling equipment 1108 and the work data storage 1109 are in the exterior of parent equipment 1101. Here, the "exterior" means the computer which became independent logically [parent equipment], and the computer and the parent equipment 1101 of this exterior are connected by bus, or it connects by the communication media for LAN.
[0052] With the form of this operation, according to the scheduling technique, two or more scheduling equipments 1108 are prepared, and these can be properly used according to the needs of a site. The important point surveillance work extractor 1102 extracts the work of a critical path, and the few work of a float as important point surveillance work with reference to the scheduling result 1110. The work distribution apparatus 1103 creates the work list classified by group for every WG which matched what is important point surveillance work among the aforementioned work with the schedule (start schedule time, completion schedule time) of the work included in a schedule with reference to the scheduling result by scheduling equipment 1108, and the information on the important point surveillance work by the important point surveillance work extractor 1102. A function and processing of a sending set 1104, the radio means 1113, a slave 1114, and a receiving set 1105 are the same as that of the form of the 1st operation. When work data control equipment 1106 compares the construction schedule sent from the work distribution apparatus 1103 with the finish time of the work which is sent from a receiving set 1105 and which was completed in fact and the actual finish time of the work which carried out [aforementioned] completion differs from a schedule finish time, the directions 1112 for changing the work data memorized by the work data storage 1109 according to the actual finish time are sent to the work data storage 1109. Furthermore, the

re-scheduling activator unit 1107 notifies the information 1111 showing a change of work data having been made to scheduling equipment 1108, and starts the re-scheduling processing based on the changed work data.

[0053] In addition, also in the form of operation of drawing 1 , the function of the important point surveillance work extractor 1102 and the re-scheduling activator unit 1107 is required after work data correction, and has included those functions in scheduling equipment 102 by drawing 1 .

[0054] When the operator of the site which works while using existing scheduling equipment and moving with the production control equipment by the form of this operation does work, the information about useful important point surveillance work can be offered on real time, and the efficiency of work improves.

[0055]

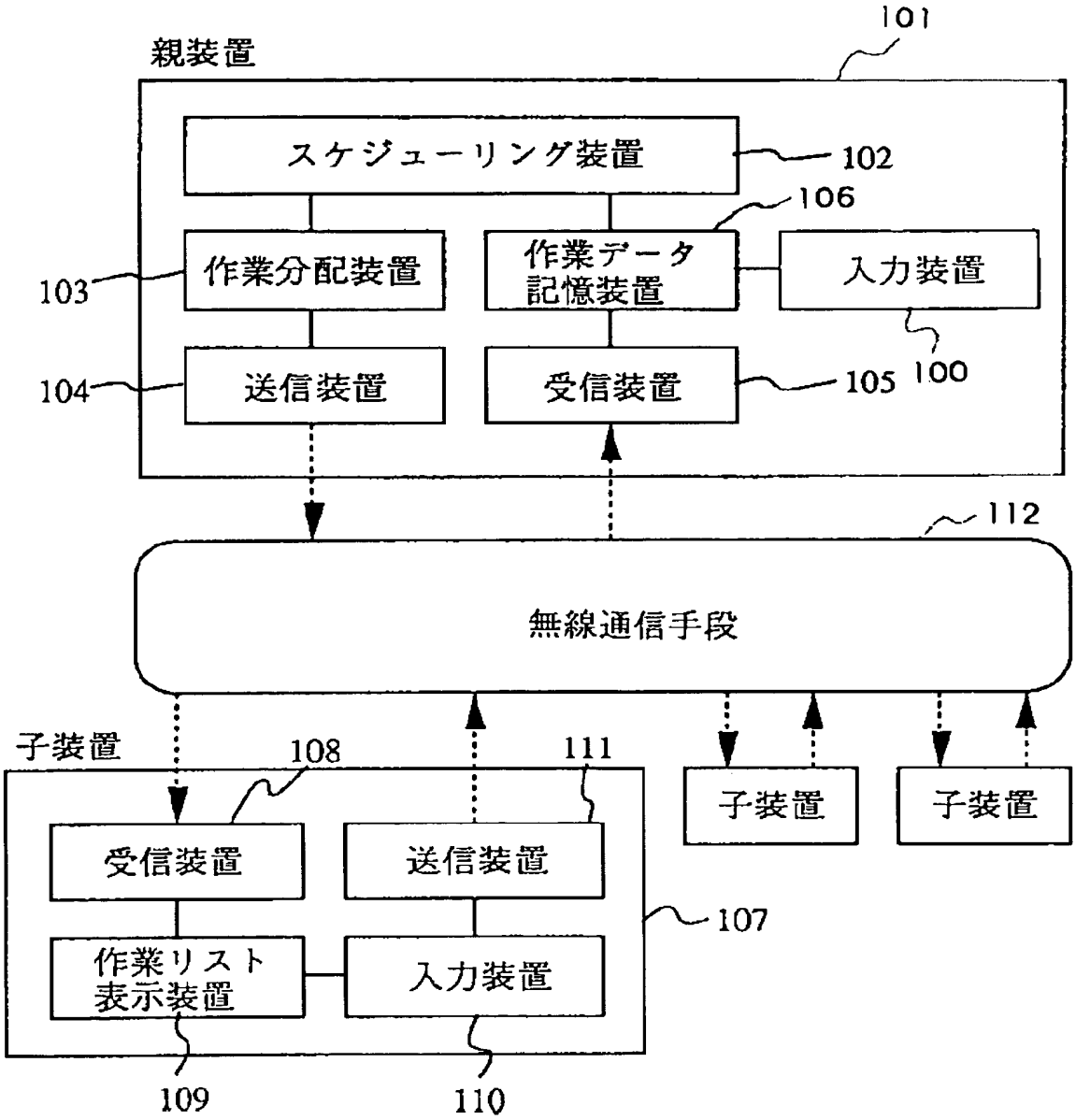
[Effect of the Invention] Since two or more WGs which work while moving by using the construction-schedule management equipment by this invention can obtain useful information on real time about the work which each group should do, it can respond also to change of a process flexibly and the efficiency of work improves.

refer nce 5

DRAWINGS

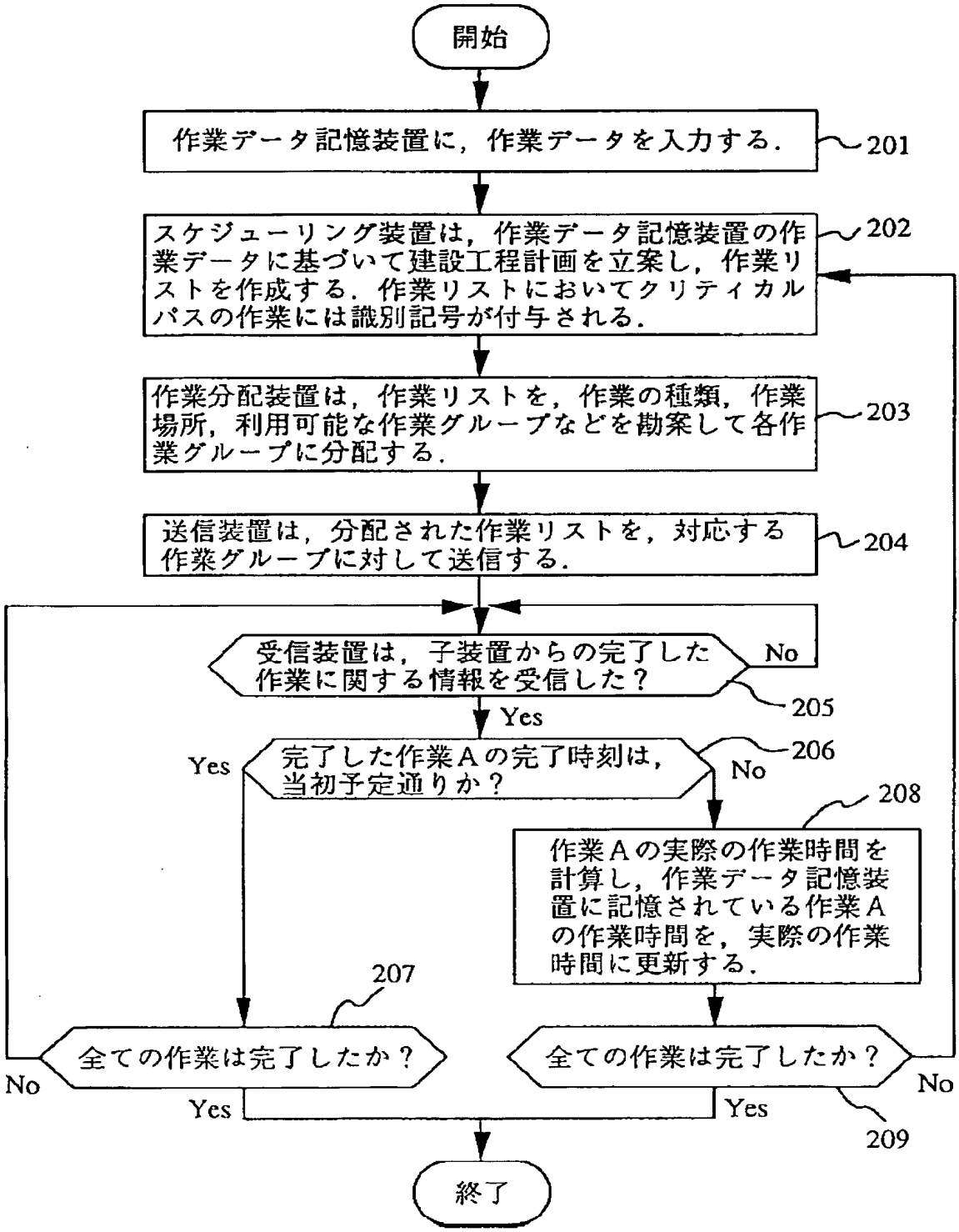
[Drawing 1]

図 1



[Drawing 2]

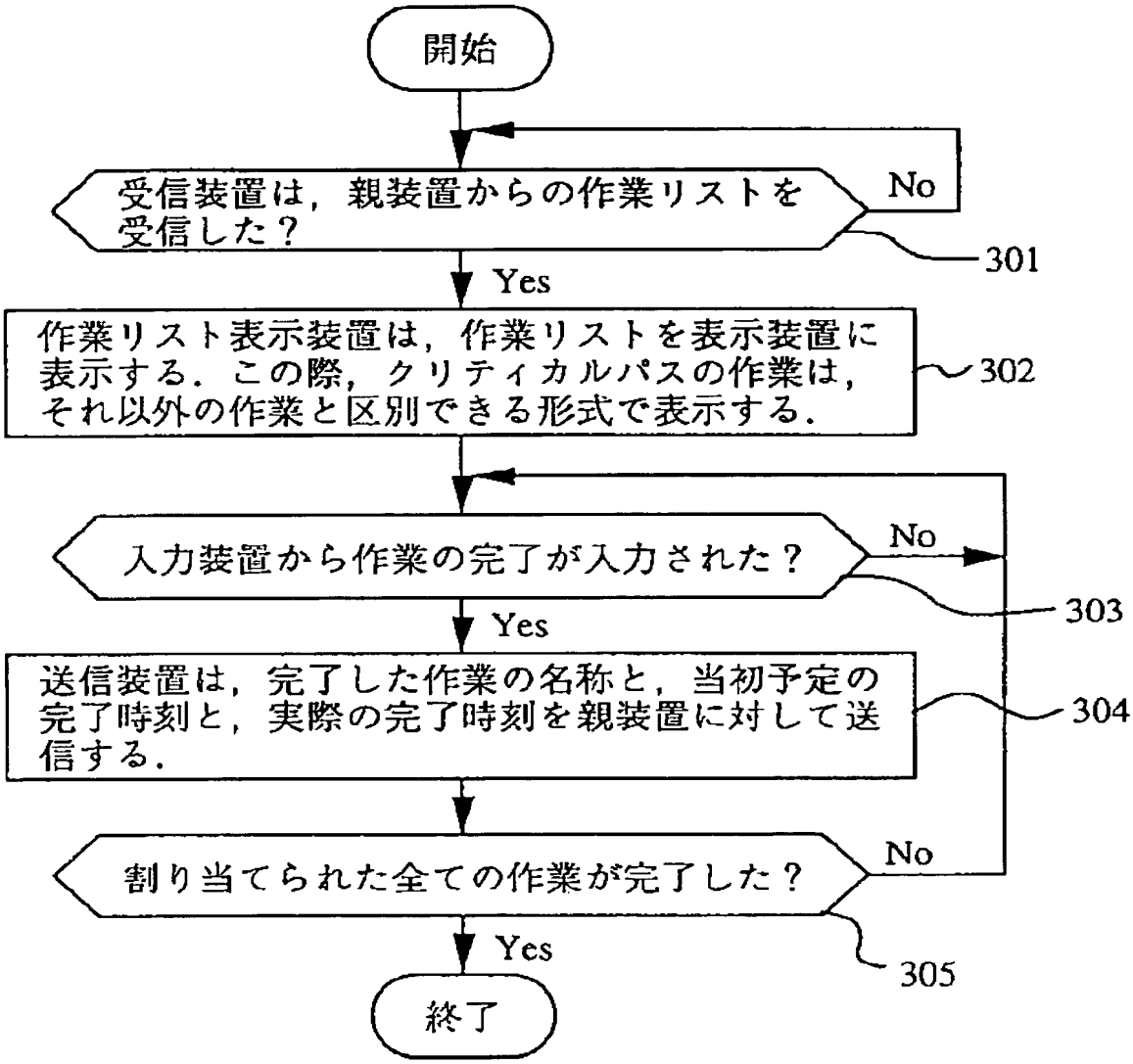
図 2


開始
作業データ記憶装置に，作業データを入力する．
201
スケジューリング装置は，作業データ記憶装置の作業データに基づいて建設工程計画を立案し，作業リストを作成する．作業リストにおいてクリティカルパスの作業には識別記号が付与される．
202
作業分配装置は，作業リストを，作業の種類，作業場所，利用可能な作業グループなどを勘案して各作業グループに分配する．
203
送信装置は，分配された作業リストを，対応する作業グループに対して送信する．
204
受信装置は，子装置からの完了した作業に関する情報を受信した？
No
205
Yes
Yes
完了した作業Aの完了時刻は，当初予定通りか？
206
No
208
作業Aの実際の作業時間を計算し，作業データ記憶装置に記憶されている作業Aの作業時間を，実際の作業時間に更新する．
207
全ての作業は完了したか？
No
Yes
全ての作業は完了したか？
No
Yes
209
終了

ref rence 5

[Drawing 3]

図 3



reference 5

[Drawing 4]

図4

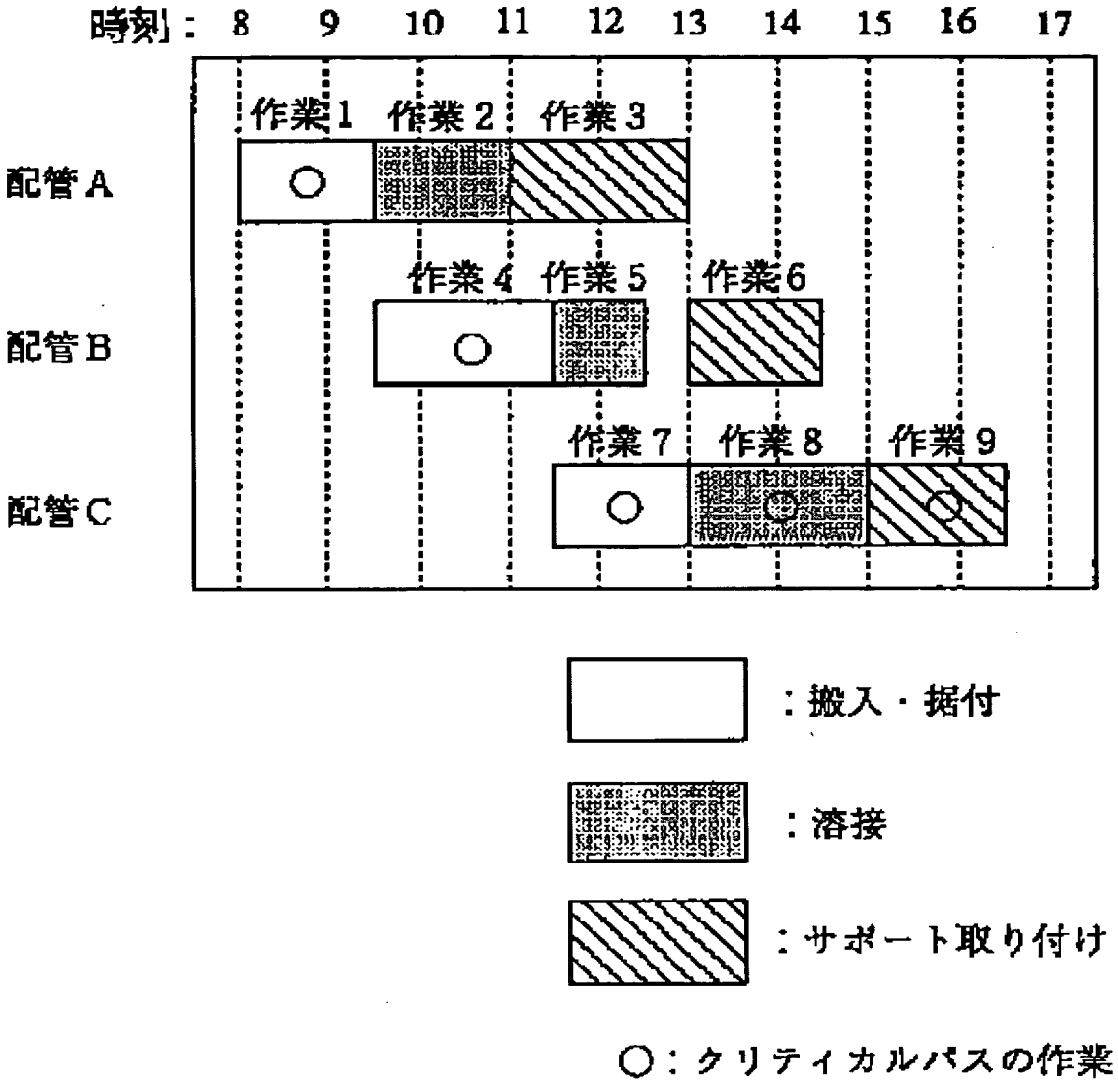
40 作業データ

41 作業番号	42 作業種類	43 標準作業時間	44 先行作業番号
1	搬入・据付	1.5	—
2	溶　接	1.5	1
3	サポート取り付け	2.0	2
4	搬入・据付	2.0	1
5	溶　接	1.0	2，4
6	サポート取り付け	1.5	3，5
7	搬入・据付	1.5	4
8	溶　接	2.0	5，7
9	サポート取り付け	1.5	6，8

refer nce 5

[Drawing 5]

図 5



reference 5

[Drawing 6]

図 6

60 作業リスト

61 作業番号	62 作業種類	63 開始時刻	64 完了時刻	65 C.P.作業
1	搬入・据付	8:00	9:30	○
2	溶　接	9:30	11:00	
3	サポート取り付け	11:00	13:00	
4	搬入・据付	9:30	11:30	○
5	溶　接	11:30	12:30	
6	サポート取り付け	13:00	14:30	
7	搬入・据付	11:30	13:00	○
8	溶　接	13:00	15:00	○
9	サポート取り付け	15:00	16:30	○

referenc 5

[Drawing 7]

図7

（a）搬入・据付グループ

71

701 作業番号	702 開始時刻	703 完了時刻	704 C.P.作業	705 完了
1	8:00	9:30	○	
4	9:30	11:30	○	
7	11:30	13:00	○	

（b）溶接グループ

72

701 作業番号	702 開始時刻	703 完了時刻	704 C.P.作業	705 完了
2	9:30	11:00		
5	11:30	12:30		
8	13:00	15:00	○	

（c）サポート取り付けグループ

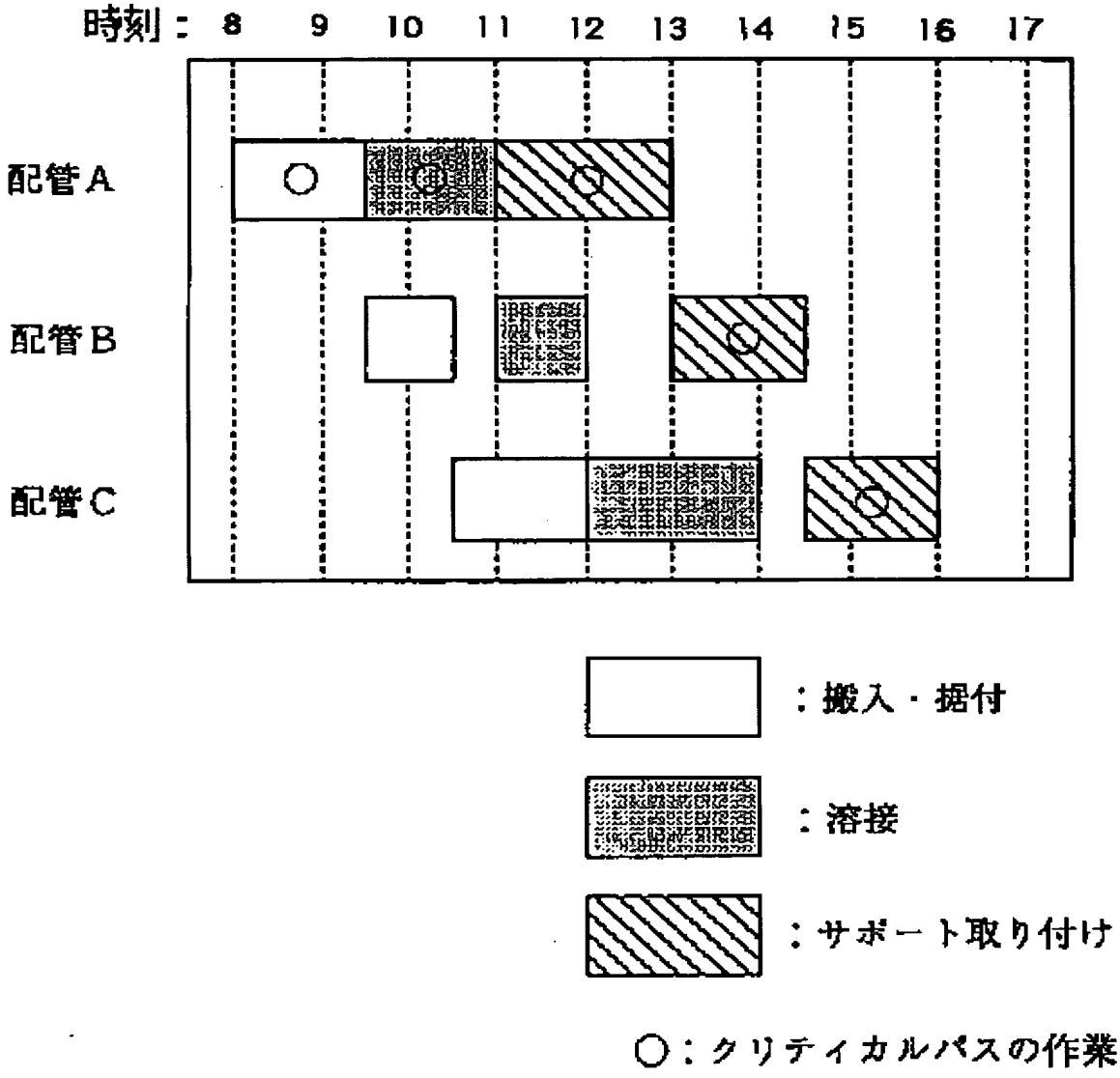
73

701 作業番号	702 開始時刻	703 完了時刻	704 C.P.作業	705 完了
3	11:00	13:00		
6	13:00	14:30		
9	15:00	16:30	○	

[Drawing 8]

ref r nc 5

図 8


時刻：
8
9
10
11
12
13
14
15
16
17
配管A
配管B
配管C
：搬入・据付
：溶接
：サポート取り付け
○：クリティカルパスの作業

refer nce 5

[Drawing 9]

図 9

90 作業リスト

作業番号	作業種類	開始時刻	完了時刻	C.P.作業
1	搬入・据付	8:00	9:30	○
2	溶　接	9:30	11:00	○
3	サポート取り付け	11:00	13:00	○
4	搬入・据付	9:30	10:30	
5	溶　接	11:00	12:00	
6	サポート取り付け	13:00	14:30	○
7	搬入・据付	10:30	12:00	
8	溶　接	12:00	14:00	
9	サポート取り付け	14:30	16:00	○

[Drawing 10]

図10

121

(a)搬入・据付グループ

作業番号	開始時刻	完了時刻	C.P.作業	完了
1	8:00	9:30	○	○
4	9:30	10:30		○
7	10:30	12:00		

122

(b)溶接グループ

作業番号	開始時刻	完了時刻	C.P.作業	完了
2	9:30	11:00	○	
5	11:00	12:00		
8	12:00	14:00		

123

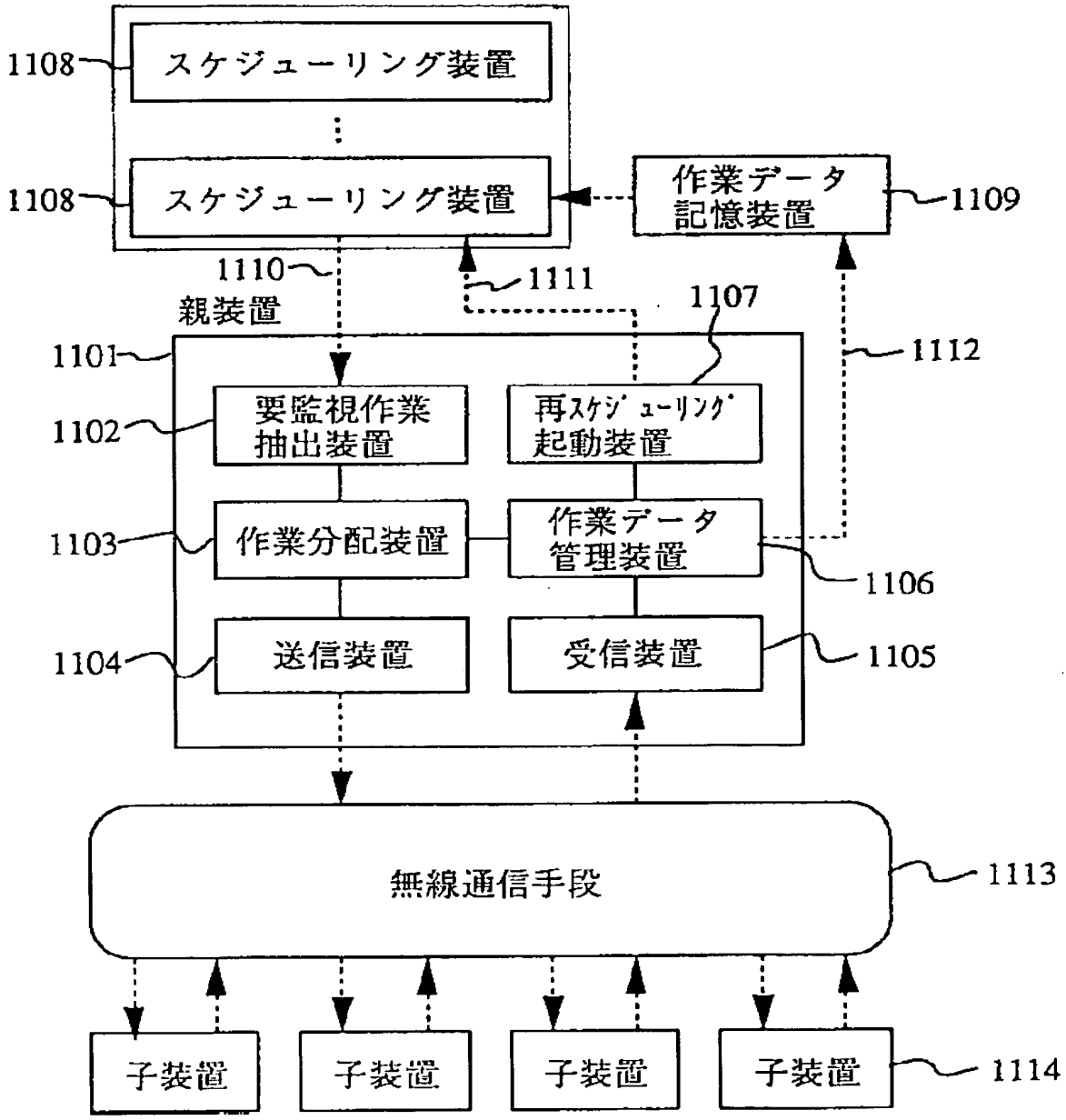
(c)サポート取り付けグループ

作業番号	開始時刻	完了時刻	C.P.作業	完了
3	11:00	13:00	○	
6	13:00	14:30	○	
9	14:30	16:00	○	

reference 5

[Drawing 11]

図11



[Drawing 12]

図12

120

作業グループ名	子装置の認識番号
搬入・据付グループ	BN0002
溶接グループ	BN0003
サポート取り付けグループ	BN0004

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the gestalt of the 1 operation by this invention.

[Drawing 2] It is the flow chart which shows the processing flow performed in the parent equipment of drawing 1 .

[Drawing 3] It is the flow chart which shows the processing flow performed in the slave of drawing 1 .

[Drawing 4] It is explanatory drawing of an example of the work data used with the gestalt of the 1 operation by this invention.

[Drawing 5] It is explanatory drawing showing an example of the construction work schedule created with the equipment of drawing 1 .

[Drawing 6] It is explanatory drawing showing the work list corresponding to the schedule of drawing 5 .

[Drawing 7] It is explanatory drawing showing the work list classified by group totaled for every WG based on the work list of drawing 6 .

[Drawing 8] It is explanatory drawing showing the construction work schedule by

which the schedule of drawing 5 was updated.

[Drawing 9] It is explanatory drawing showing the work list corresponding to the schedule of drawing 8 .

[Drawing 10] It is explanatory drawing showing the work list classified by group totaled for every WG based on the work list of drawing 8 .

[Drawing 11] It is the block diagram showing the form of other operations by this invention.

[Drawing 12] It is explanatory drawing of the table used with the form of operation by this invention.

[Description of Notations]

101: Parent equipment of construction-schedule management equipment

102: Scheduling equipment

103: Work distribution apparatus

104: Sending set

105: Receiving set

106: Work data storage

107: The slave of construction-schedule management equipment

108: Receiving set

109: Work list display equipment

110: Input unit

111: Sending set

112: Radio means

201-209: The processing step performed with parent equipment

301-308: The processing step performed by the slave

1101: Parent equipment

1102: Important point surveillance work extractor

1103: Work distribution apparatus

1104: Sending set

1105: Receiving set

1106: Work data control equipment

1107: Re-scheduling activator unit

1108: Scheduling equipment

1109: Work data storage

1110: Scheduling result

1111: Re-scheduling starting directions

1112: Work data change directions

reference 5

1113: Radio means
1114: Slave

CORRECTION or AMENDMENT

[Official Gazette Type] Printing of amendment by the convention of 2 of Article 17 of patent law
[Section partition] Part IV gate
[Date of issue] January 29, Heisei 15 (2003. 1.29)

[Publication No.] JP,9-158478,A
[Date of Publication] June 17, Heisei 9 (1997. 6.17)
[**** format] Open patent official report 9-1585
[Filing Number] Japanese Patent Application No. 7-321888
[The 7th edition of International Patent Classification]
E04G 21/00
G06F 13/00 355
17/60
[FI]
E04G 21/00
G06F 13/00 355
15/21 R
L

[Procedure revision]
[Filing Date] October 24, Heisei 14 (2002. 10.24)
[Procedure amendment 1]
[Document to be Amended] Specification
[Item(s) to be Amended] Claim
[Method of Amendment] Change
[Proposed Amendment]
[Claim(s)]
[Claim 1] It is construction-schedule management equipment which performs

creation and management of a construction work schedule.
It has parent equipment and two or more slaves owned for every WG.
The aforementioned parent equipment extracts the important point surveillance work on production control while drawing up the schedule of the work which each WG should do. The 1st function transmitted to the slave which matches the schedule of the aforementioned work, and important point surveillance work, and each WG owns,
It has the 3rd function transmitted to the 2nd function to receive the information about completion of work from the aforementioned slave, and the slave which updates the schedule of work, and important point surveillance work according to the information about the completion of work which this received, and each WG owns.
Construction-schedule management equipment characterized by providing the following. Each of two or more aforementioned slaves is the 4th function to receive the schedule of the work which a its original work business group should do from parent equipment. The 5th function which outputs the schedule of the received this work to a user in form that important point surveillance work and the other work are distinguishable The 6th function to transmit this information to parent equipment when a user inputs completion of work into a slave
[Claim 2] It is construction-schedule management equipment which performs creation and management of a construction work schedule.
It has parent equipment and two or more slaves owned every two or more WGs prepared beforehand.
The aforementioned parent equipment,
Creation of a construction work schedule, and a scheduling means to make a change,
A work distribution means to create the work list classified by group for every WG which has the schedule start time and finish time of the construction work contained in this schedule, and the identifier which shows whether the work concerned is the important point surveillance work on production control,
The 1st transmitting means sent to the slave in which each WG owns each work list classified by group which this work distribution ****** created using a radio means,
The 1st receiving means which receives the name and finish time of the completed work which is notified using a radio means from this slave,
this -- when the actual finish time of the work concerned which received by the 1st receiving means differs from the schedule finish time, a schedule change directions means to direct change of a construction work schedule for the scheduling means of the aforementioned parent equipment constitutes -- having
The aforementioned slave,

The 2nd receiving means which receives the work list sent using a radio means from the 1st sending set of the above,
this -- an output means to output the work list received by the 2nd receiving means to a user in form that important point surveillance work and other work are distinguishable
An input means by which a user inputs the name and finish time of the completed work,
Construction-schedule management equipment characterized by being constituted by the 2nd transmitting means which notifies the name and finish time of the inputted this work which was completed to the aforementioned parent equipment using a radio means.
[Claim 3] It is construction-schedule management equipment which performs creation and management of a construction work schedule.
It has parent equipment and two or more slaves owned every two or more WGs prepared beforehand.
The aforementioned parent equipment,
A work data-storage means to match and memorize the name of the work which should be done at least, the working hours this work is due to take, and the conditions which should be satisfied in order to start this work,
A scheduling means to extract the important point surveillance work on production control while drawing up a construction work schedule based on this data, when these work data are created or changed,
The schedule start time and finish time of the construction work contained in this schedule, and a work distribution means to create the work list classified by group for every WG which has the identifier which shows whether the work concerned is the aforementioned important point surveillance work,
The 1st transmitting means sent to the slave in which each WG owns each work list classified by group which this work distribution apparatus created using a radio means,
The 1st receiving means which receives the name and finish time of the work completed using the radio means from this slave,
It is constituted by schedule change directions means to direct change of the aforementioned construction work schedule to the aforementioned scheduling means while correcting so that the work data memorized by the work data-storage means may suit an actual work progress situation when the actual finish time of the received this work differs from the schedule finish time.

Each of the aforementioned slave,
The 2nd receiving means which receives the work list sent using a radio means from the transmitting means of the above 1st,
An output means to output the received this work list to a user in form that important point surveillance work and other work are distinguishable,
An input means by which a user inputs the name and finish time of the completed work,
Construction-schedule management equipment characterized by being constituted by the 2nd transmitting means which notifies the name and finish time of the inputted work which was completed to the aforementioned parent equipment using a radio means.
[Claim 4] It is construction-schedule management equipment which performs creation and management of a construction work schedule.
A work data-storage means to match and memorize the name of the work which should be done at least, the working hours this work is due to take, and the conditions which should be satisfied in order to start this work,
A scheduling means to extract the important point surveillance work on production control while drawing up a construction work schedule based on these work data,
It is constituted by work distribution means to create the work list classified by group for every WG which has the schedule start time and finish time of the construction work contained in this schedule, and the identifier which shows whether the work concerned is the aforementioned important point surveillance work.
Construction-schedule management equipment with which new important point surveillance work is extracted while the aforementioned scheduling means updates the aforementioned construction work schedule, when [which be memorized for the aforementioned work data-storage means] it shifts and those data are changed, and the aforementioned work distribution means is characterized by creating each work list classified by group corresponding to the this updated schedule.
[Claim 5] 1st transmitting means to notify to the slave in which each WG owns each work list classified by group which work distribution apparatus created in construction-schedule management equipment according to claim 4 using a radio means, The 1st receiving means which receives the name and finish time of the completed work which is notified using a radio means from the aforementioned slave, this -- the construction-schedule management equipment characterized by having with a correction means to correct the work data memorized by the aforementioned work data-storage means so that it may actually suit when the actual finish time of

this work received by the 1st receiving means differs from the schedule finish time

[Claim 6] Construction-schedule management equipment according to claim 5 characterized by providing the following The aforementioned slave which each WG owns is 2nd receiving means which receives the work list classified by group notified using a radio means from the transmitting means of the above 1st. this -- an output means to output the work list classified by group received by the 2nd receiving means to a user in form that important point surveillance work and other work are distinguishable

[Claim 7] The aforementioned slave which each WG owns in construction-schedule management equipment according to claim 5 is construction-schedule management equipment characterized by to have the 2nd transmitting means which notifies an input means to by_which a user inputs the name and finish time of the completed work, and the name and the finish time of the this inputted work which was completed to the aforementioned parent equipment using a radio means.

[Claim 8] Construction-schedule management equipment characterized by the aforementioned important point surveillance work being the work of a critical path in construction-schedule management equipment given in either of the claims 4-7.

[Claim 9] Construction-schedule management equipment characterized by constituting the aforementioned WG based on an occupational description and a work site in construction-schedule management equipment given in either of the claims 4-7.

[Claim 10] It is the construction-schedule management method which performs creation and management of a construction work schedule using the parent equipment and two or more slaves which can radiocommunicate mutually.

In the aforementioned parent equipment

a1 Step which extracts the important point surveillance work on production control while creating a construction work schedule based on the work data which matched the name of the work which should be done at least, the working hours this work is due to take, and the conditions which should be satisfied in order to start this work,

a2 Step which creates the work list classified by group for every WG which has the schedule start time and finish time of the construction work contained in the created this schedule, and the identifier which shows whether the work concerned is the aforementioned important point surveillance work,

a3 It has the step which sends each created this work list classified by group to the slave which each WG owns by radio, and sets to each slave.

b1 Step which receives the work list classified by group from the aforementioned

parent equipment,
b2 Step which outputs the received this work list classified by group to a user in form that important point surveillance work and other work are distinguishable,
b3 Step which inputs the name and finish time of the completed work,
b4 It has the step which notifies the name and finish time of the inputted work which was completed to the aforementioned parent equipment by radio.
Furthermore, it sets to the aforementioned parent equipment.
a4 Step which receives the name and finish time of the completed work from the aforementioned slave,
a5 Step which judges whether the actual finish time of the received this work differs from the schedule finish time,
a6 Step which corrects so that the work data memorized by the work data-storage means may suit an actual work progress situation, when judged with differing,
a7 Step which returns to Step a1 following Step a6,
The construction-schedule management method which ****.
[Claim 11] In construction-schedule management equipment equipped with parent equipment and two or more slaves
The aforementioned slave is assigned for every WG.
The aforementioned parent equipment draws up the work schedule which each of the aforementioned WG should carry out, and transmits it to the slave in which each WG has this.
The aforementioned slave transmits the information about completion of work to parent equipment.
The aforementioned parent equipment is construction-schedule management equipment characterized by updating a work schedule and transmitting the this updated work schedule to the slave to which it was assigned by each WG when progress differs from the schedule.
[Claim 12] In construction-schedule management equipment according to claim 11
The aforementioned parent equipment is construction-schedule management equipment characterized by transmitting to the slave which extracts the important point surveillance work on production control while drawing up the schedule of the work which each WG should do, and matches the schedule of the aforementioned work, and important point surveillance work, and each WG owns.
[Claim 13] In construction-schedule management equipment according to claim 12
The aforementioned slave is construction-schedule management equipment characterized by displaying the schedule of work which received in form that

important point surveillance work and the other work are distinguishable.